Redfish

Issue #6, December 2011

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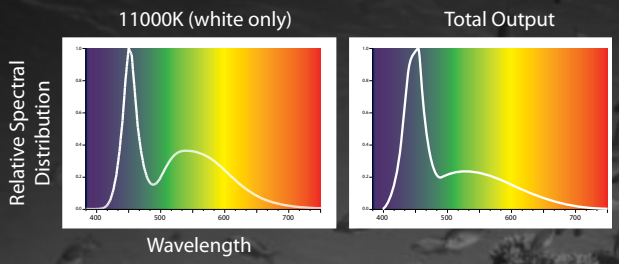

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Redfish contents

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This month's Eye Candy Contents Page Photos courtesy:

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'Starfish, Waterlemon Cay, St. John, USVI' by Brad Spry
'Water Ballet' by Martina Rathgens
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(Bottom row. Left to Right)
'Tide Pooling' by Steve Juruetson
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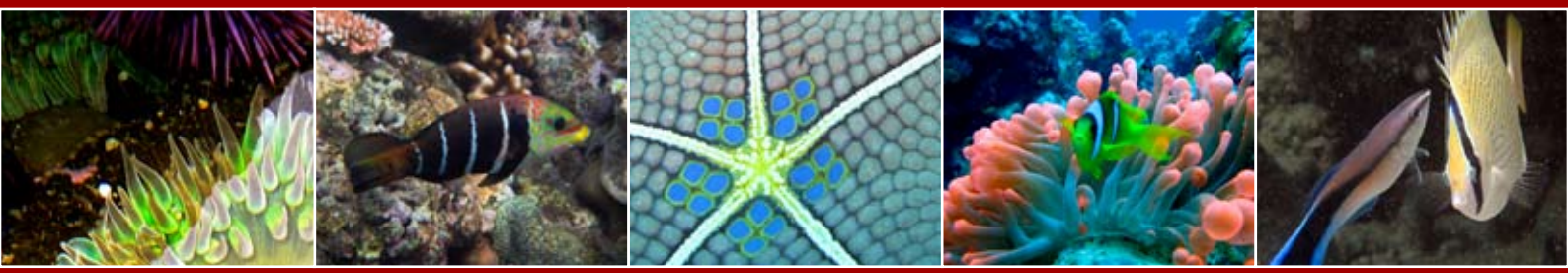

About Redfish

Redfish is a free-to-read magazine
for fishkeeping enthusiasts.

At Redfish we believe in the free exchange of information to facilitate success by aquarium and pond hobbyists. Each month Redfish Magazine will bring you dedicated sections on tropical, coldwater, marine and ponds.

Redfish was founded in early 2011 by Jessica Drake, Nicole Sawyer, Julian Corlet and David Midgley.

We hope you enjoy this, the sixth issue of Redfish.

古池や蛙飛込む水の音
ふるいけやかわずとびこむみずのおと

Photo courtesy: (matt)

The Fine Print
Redfish Magazine

Saving Nemo:
charisma is not enough

Gland, Switzerland, 13 December, 2011 (IUCN)
If conservation action is not taken, there may come a time when no one will be able to find Nemo. One in every six species related to characters in the movie Finding Nemo is threatened by extinction, according to a new study by IUCN (International Union for Conservation of Nature) and Simon Fraser University.

A team of marine scientists have analyzed the extinction risk and reviewed successful conservation programmes for Nemo, the charismatic clownfish, as well as more than 1,500 other species related to characters in the 2003 Disney/Pixar animated movie, Finding Nemo.

The study revealed that widely distributed animals like turtles and sharks are at most risk, and hunting and fishing poses the greatest threat to species' survival.

"Putting Nemo in office aquariums, making soup out of Anchor the shark's fins and selling Sheldon the seahorse as curios has taken a toll," says Loren McClenachan, the study's lead author and NSF International Postdoctoral Fellow at Simon Fraser University. "Our research highlights how very little we know about many of these animals. It's unthinkable that the characters in Finding Nemo could become extinct, but this is the reality unless we pay more attention to the diversity of marine life."

All species of marine turtles ("Squirt" and "Crush") and more than half of all hammerhead sharks ("Anchor"), mackerel sharks ("Bruce" and "Chum"), and eagle rays ("Mr. Ray") are threatened. Seahorses ("Sheldon") are the most threatened group of bony fish in Finding Nemo, with two in five species at risk of extinction. Despite a demonstrated need for conservation action, regulation of trade in endangered marine species is severely deficient for those with high economic value, like sharks.

"Our study found that threatened sharks and

Ocellaris Clownfish (*Amphiprion ocellaris*)
Photo by Natascia Tamburello

Green turtle (*Chelonia mydas*)
Photo by Ryan Cloutier

Scalloped Hammerhead (*Sphyrna lewini*)
Photo by Terry Goss, 2008 Marine Photobank

rays lacked needed protection against international trade, compared to all other groups. Fewer than one in ten species of threatened sharks and rays considered in the study were protected by the CITES (Convention on International Trade of Endangered Species)," says co-author Nicholas Dulvy, co-chair of the IUCN Shark Specialist Group and Associate Professor of Biology at Simon Fraser University. "For sharks and rays this is particularly concerning, as these species are highly vulnerable to overexploitation."

an Eagle Ray. Photo by Renata Ferrari Legorreta. Marine Photobank

Conservation relies on strong, well-founded science, but knowledge shortfalls exist for the majority of marine species. Small species and invertebrates, such as Pacific Cleaner Shrimp (*Lysmata amboinensis*) (like "Jaques"); suffer the most. This lack of data raises the concern that small species could face local and regional extinction without the conservation community being aware.

While the research shows a stark shortfall in ocean management and marine conservation, there is still hope. For example, protecting turtles against entanglement in commercial fishing gear and from hunting has helped reverse trends in some locations. "We have the tools to save marine species, particularly through international treaties such as CITES," says co-author Kent Carpenter, Professor at Old Dominion University and Manager of the IUCN Marine Biodiversity Unit "Implementation of coordinated international conservation initiatives are necessary as charisma alone is not enough to ensure a species' survival."

White shark (*Carcharodon carcharias*) Photo by Terry Goss

Three-spotted Seahorse (*Hippocampus trimaculatus*). Photo by A Bijukumar Marine Photobank

About IUCN

IUCN, International Union for Conservation of Nature, helps the world find pragmatic solutions to our most pressing environment and development challenges.

IUCN works on biodiversity, climate change, energy, human livelihoods and greening the world economy by supporting scientific research, managing field projects all over the world, and bringing governments, NGOs, the UN and companies together to develop policy, laws and best practice.

IUCN is the world's oldest and largest global environmental organization, with more than 1,200 government and NGO members and almost 11,000 volunteer experts in some 160 countries. IUCN's work is supported by over 1,000 staff in 45 offices and hundreds of partners in public, NGO and private sectors around the world.

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Where land and water meet: *Planted* Riparium

By Jacob and Ronald Jung, Photos by Devin Biggs

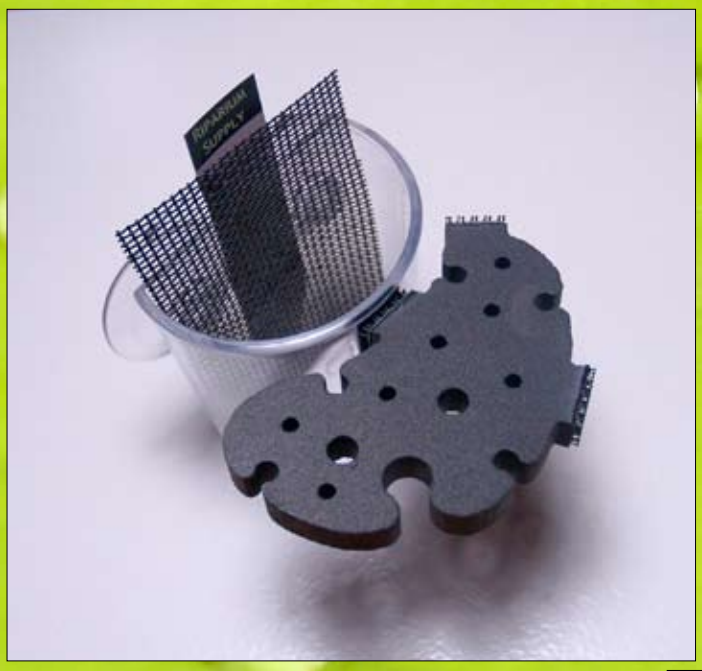
When one thinks of a lake, river or stream, often the last thing that comes to mind is the water. We tend to, however, remember the shorelines that border these bodies of water. These shorelines are very diverse and filled with a large number of interesting plant specimens. They are so interesting, that aquarists have created a new type of planted aquarium which attempts to emulate these shorelines. The name given to these shoreline setups is riparium.

Riparіums emulate shorelines by utilizing the plants found along bodies of water. Each plant is individually planted in specially designed planters or rafts, which are placed slightly under the water line and on the back and sides of an aquarium. As the plants grow, not only do they add a fascinating beauty to the display, but they also absorb nutrients from the water column of the aquarium. This feature dramatically increases the water quality of the aquarium, making riparіums a great home for fish.

Planted riparіums should not be confused with paludarium or vivarium type setups, as they are quite different. Paludariums and vivariums utilize immobile land areas, and tend to be more like terrariums (land only setups) with large water features. The planters and rafts that make up a riparium on the other hand, are very mobile and are not real land masses. Riparіums can be viewed as a hybrid type of aquarium.

The Planters and Rafts

The riparium planters form the base of all riparium display tanks. The planters are designed in an unobtrusive cup-like shape which allows them to hold both a planting substrate and the roots of a riparium plant. Each planter is designed to allow water from the aquarium to enter into the planter, usually through small holes. The aquarium water is absorbed by the riparium plant as its vital source of water and nutrients. To attach the planters to the glass of the display tank, planters are equipped with either suction cups or sandwich magnets. These attachment accessories keep the planter in place, but also make it possible to easily rearrange the riparium display.



The rafts are made of buoyant, closed cell foam and make up the foreground of the riparium display. The surface of the foam that makes up the rafts is honey combed with holes. These holes go all the way through the raft, and are used to hold the stems of the riparium plants. As the riparium plants on the rafts grow, their root systems develop under water on the underside of the raft, while the plant's foliage grows out on the top.

the roots of this Anubias species grow readily down into the aquarium water.

To create more depth in a riparium display, many planters and rafts are equipped with various mechanical features which enable them to attach to each other. Not only does this add depth to the display, but it also lets one put more plants into a smaller space.

Riparium planters and rafts are available from online retailers such as Riparium Supply (www.riparіumsupply.com), though several hobbyists have been able to create "DIY" versions.

The Riparium Styles

Now that you know the ins and outs of the planters and rafts, I will begin to cover the three main styles or types of planted riparіums. A key feature of setting up a planted riparium is deciding on what style the new composition will attempt to emulate. Many of the decisions concerning equipment, flora and fauna are affected by what style is chosen. These styles vary mainly when it comes to water level and humidity, which play a major role in what plants are suitable for a display.

The first style is perfect for aquarists that enjoy collecting plants. The water level in this style is about 1/3rd of the fish tank's total volume. Humidity is very high, which can be achieved by the use of a hood or glass lid over the tank. The high humidity levels in this type of riparium make it perfect for growing emersed aquatic plants. This style has a boxed feel, as the plants stay within the aquarium.

The second approach also has a low water level (again,

about 1/3rd of the tank's total volume). Humidity, however, is on the lower side, as a hood or lid is not used. This setup tends to not use emersed aquatic plants (as most need lots of humidity to survive), but does use some of the larger riparium plant specimens. The use of pendant light fixtures and rimless aquariums are highly recommended for this type of composition.

The final design, unlike the other two, has a high water level of about 80-100% of the tank's total volume. Humidity is low, and the use of pendant or hanging light fixtures is a necessity. The larger amount of water kept in the riparium makes this style perfect for showcasing fish.

Riparium Equipment

The equipment (other than the planters and rafts) used to keep a planted riparium functioning slightly differs from the equipment used in traditional planted aquariums.

Proper filtration in the planted riparium is best achieved if a canister or in-tank filter is used. Canister filters are the best option in my opinion as they can properly filter high volumes of water and can be used in riparium with lower water levels. In-tank filters also work in low water riparium, but take up much more space in the tank and aren't as powerful. Practically any light fixture used for planted aquariums can be used over a planted riparium. Most riparium hobbyists tend to stick with LED, T5 high output and metal halide fixtures, however, as these seem to be the most powerful and

riparium hanging planter and trellis raft with Iguanura tenuis palm and Pilea grandifolia

trellis raft with a *Pilea grandifolia* plant

are easy to hang.

I have also found that many T5 high output light fixtures made for hydroponic setups are perfect for planted riparium. Hydroponic T5 light fixtures tend to be very easy to hang, and the price is often fair. If you have a local hydroponics store, or know of a good online retailer check them out when shopping around.

An aspect of lighting the planted riparium that is often overlooked is the shade given off by the planters and rafts. If you plan on growing any aquatic plants in the display, take that into account when purchasing your light fixture.
As with any part of an aquarium, be sure to do your research! Make sure that the equipment will work with your setup.

Riparium Plants and How to Care for Them

The plants native to most shorelines are very specialized, as they have adapted to surviving without oxygen around their root systems. These adaptations occur due to the lack of oxygen in the soil in which they are rooted. The lack of oxygen is caused by excessive amounts of water, which saturates the soil removing any air. The vast majority of plants require oxygen around their root systems. If the oxygen depletes, the cells that form the roots die out, killing the plant. Without these specializations, the areas around rivers and lakes would be wastelands and erosion would greatly increase.

The conditions in a riparium provide all the vital requirements for plants to grow and prosper: water, energy and nutrients. The plants absorb water from the aquarium itself, they receive energy via the lighting over the riparium, and they receive micro and macro nutrients from the aquarium's water column, along with carbon dioxide from our atmosphere, which is rich in CO_2.

Obtaining the majority of riparium plants is not difficult. A large number of them are very popular in the house plant and pond industries so purchasing a new riparium plant can be as simple as going to your local nursery, or clicking a button on your favorite pond plant seller's website. *Spathiphyllum* (Peace lilies), *Dieffenbachia* (Dumb canes), various *Pilea*, *Acorus* (Sweet flags), *Cyperus* (Umbrella sedges), *Chamaedorea elegans* (Parlor Palm), *Lysimachia nummularia* (Creeping Jenny) and *Pogonatherum crinitum* (Baby panda bamboo) are few examples of common riparium plants which are also popular in the houseplant and pond hobbies.

For a high humidity riparium, emersed aquatic plants are another option. *Cryptcorynes*, *Echinodorus* swords, *Microsorum pteropus* (Java ferns), *Anubias*, *Limnophilia*, *Alternathera*, *Bacopa* and many others make amazing riparium plants. Such specimens can be found at local fish stores, fellow hobbyists or online dealers. Keep in mind that it takes some time for aquatic plants to change to their emersed form.

Why Planted Riparium?

Now that you know a bit about planted riparium, why set one up? What are the advantages to using the riparium

planting system? For one, the roots of the riparium plants provide plenty of protective cover for shy fish and fry. This makes them great for breeding aquariums.

The riparium plants also greatly increase the aquarium's water quality. As they grow, plants absorb nitrogenous wastes from the water column of the aquarium. This aspect makes planted riparium very fish friendly. If you are a plant collector, riparium cater to you too: Many riparium plants are interesting on both biological and aesthetic levels and with the many untried specimens out there, you are sure to stay interested for a long time.

The final and very important reason, however, is the beauty of the displays. With pleasing colors and textures, the riparium plants add a new and beautiful emersed dimension to the normal planted aquarium.

Conclusion

Although relatively new, planted riparium have been increasing in popularity by leaps and bounds- and it is no wonder why! Their beauty, advantages and ease of care make them perfect for any hobbyist, from the expert to the newbie. Riparium give the hobbyist the ability to not only replicate the rarely seen depths of creeks and lakes, but also the beautiful and intriguing shoreline where land and water meet. I urge you to give planted riparium a try, and bring the water of your aquarium a little closer to shore.

Recommended reading

This article covered some of the very raw basics of the planted riparium hobby. If it interests you, I highly recommend you research this topic more. A few online sites that have great riparium related content include: The Jake-arium (www.thejakearium.com), Hydrophyte's Blog (www.hydrophytesblog.com) and Aquatic Plant Enthusiasts aquarium forum (www.aquaticplantenthusiastsforum.com). A simple Google search will also yield many great websites.

Redfish Magazine Photo Contest. Oct 2011 - Dec 2011

Redfish Magazine is pleased to announce the second of its quarterly Aquarium Photo Contests for 2011-2012. Each month we'll publish our favourite reader submitted photos, and in January 2012, we'll announce the winners for this round.

The theme this quarter is:

"My fish and I"

This quarter we are pleased to be able to offer an AquaOne Nautillus 1100 canister filter as a prize!
Many thanks to AquaOne for supplying the prize.

CODEWORD: MANAGUENSE

Entering the photo contest

Entering the photo contest is simple.
Email your name, the codeword, postal address and a high res. version of your photo to competitions@redfishmagazine.com.au.

Please check the rules and regulations prior to entry.
"Waiting for Separation" by Hamid Najafi.

Rules and Regulations

Photo must be your own work. Post processing of your own images is allowed. You must be over 18 years of age to enter the competition.

Detailed rules and regulations are available at:
www.redfishmagazine.com.au/competitions/2011_photo_comp_1
"Untitled" by D. Sharon Pruitt.

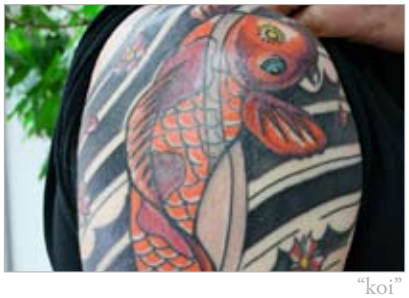
Need Inspiration?

Here are some amazing aquatic images from flickr!

"Diver Silhouette" by Tim Sheerman-Chase

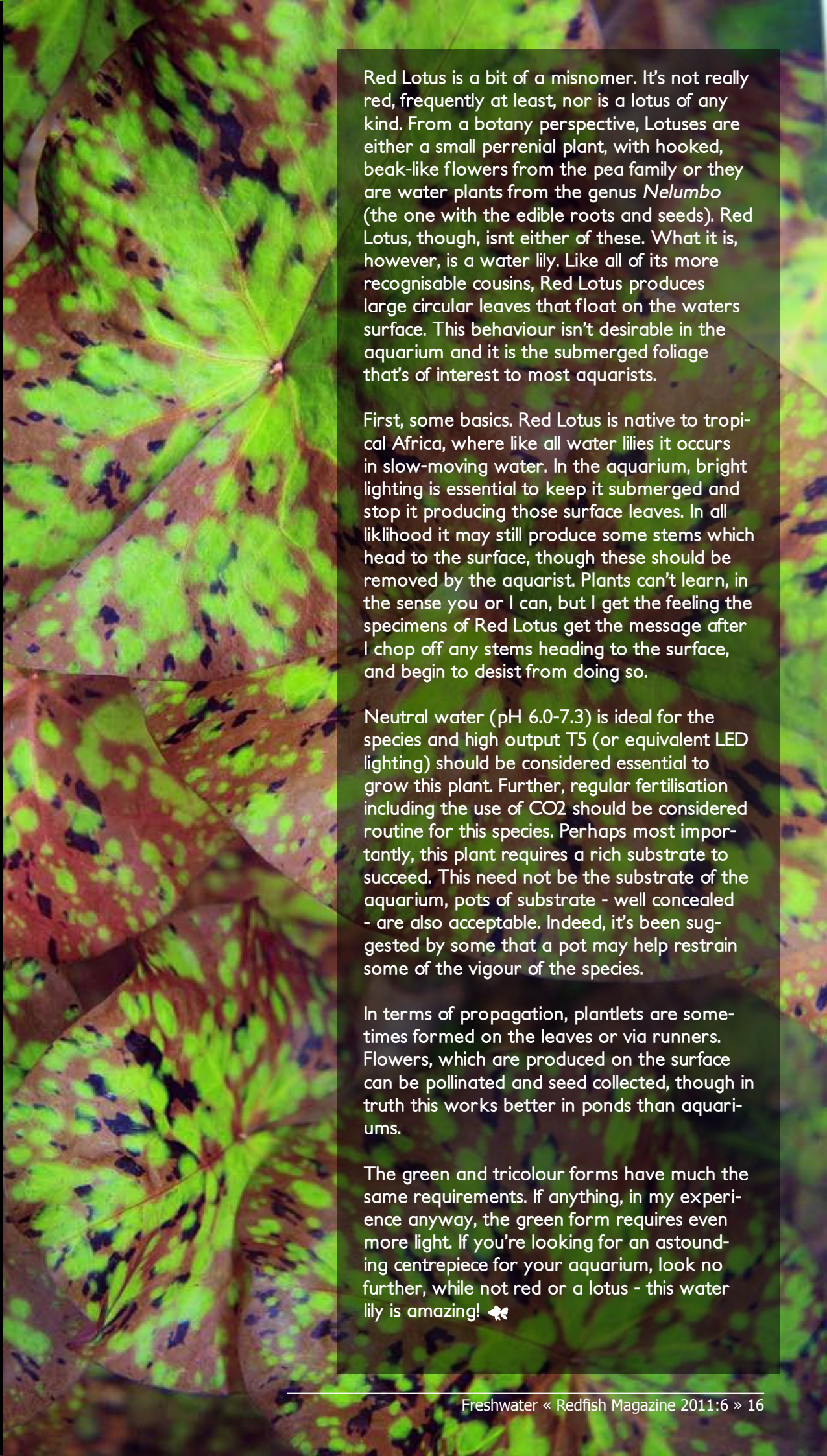
"Starfish" by Clinton & Charles Robertson

"pictures at the aquarium" by Luis Argerich



"koi" by Sabotrax

RED LOTUS



Red Lotus is a bit of a misnomer. It's not really red, frequently at least, nor is a lotus of any kind. From a botany perspective, Lotuses are either a small perrenial plant, with hooked, beak-like flowers from the pea family or they are water plants from the genus *Nelumbo* (the one with the edible roots and seeds). Red Lotus, though, isnt either of these. What it is, however, is a water lily. Like all of its more recognisable cousins, Red Lotus produces large circular leaves that float on the waters surface. This behaviour isn't desirable in the aquarium and it is the submerged foliage that's of interest to most aquarists.

First, some basics. Red Lotus is native to tropical Africa, where like all water lilies it occurs in slow-moving water. In the aquarium, bright lighting is essential to keep it submerged and stop it producing those surface leaves. In all liklihood it may still produce some stems which head to the surface, though these should be removed by the aquarist. Plants can't learn, in the sense you or I can, but I get the feeling the specimens of Red Lotus get the message after I chop off any stems heading to the surface, and begin to desist from doing so.

Neutral water (pH 6.0-7.3) is ideal for the species and high output T5 (or equivalent LED lighting) should be considered essential to grow this plant. Further, regular fertilisation including the use of CO2 should be considered routine for this species. Perhaps most importantly, this plant requires a rich substrate to succeed. This need not be the substrate of the aquarium, pots of substrate - well concealed - are also acceptable. Indeed, it's been suggested by some that a pot may help restrain some of the vigour of the species.

In terms of propagation, plantlets are sometimes formed on the leaves or via runners. Flowers, which are produced on the surface can be pollinated and seed collected, though in truth this works better in ponds than aquariums.

The green and tricolour forms have much the same requirements. If anything, in my experience anyway, the green form requires even more light. If you're looking for an astounding centrepiece for your aquarium, look no further, while not red or a lotus - this water lily is amazing!

Today In The Fishroom

with Mo Devlin

Better photographs of your Bettas

With their long, spectacularly coloured fins, there's not a more photogenic subjects than *Betta splendens*

Text and photos by Mo Devlin

A good friend of mine keeps telling me that I should be a more active "blogger". Like most, I manage to juggle a job, family life and still find precious little time to, as my father always told me, "invest in the things that make me happy". If you would have asked me twenty years ago, I would have said it was my fish collection.

I'm fortunate that I have two real passions in life: my fish and my photography. As luck would have it, they have dovetailed nicely over the years. If asked today, I would have to say that it's actually more taking photos of my fish and not simply just keeping the fish.

I remind my friend that I've been "blogging" for the better part of twenty years. I do it on various forums across the globe under the heading, "Today in the Fishroom". True…most of it is photos with captions or short paragraphs, but I have found that I can convey my "message" better more so through photos. Over the years I have received hundreds of emails telling me that someone has added a specific fish to their collection after seeing it featured in one of my "blogs". It's the highest compliment and always makes me feel good about my contribution to the hobby.

How is it done?

One of the questions I am most often asked is how I manage to capture the color and clarity in my photographs. The simple answer is always the same…light. It all comes down to how much light and how it is directed on a subject. Ninety-nine percent of all of the photographs I take are done using at least two or more often up to four flash units. Available light just isn't an option.

All of my equipment, from flash to camera and lens are Nikon products. The flash, a Nikon SB-900, when mounted on a camera can illuminate a subject up to twenty or more feet away. When you train four of them onto an area of the fish tank that might be one or two foot square, it's easy to imagine the amount of light cast on the "sweet spot". This set up allows me to shoot at a very low ISO (100) and a very high aperture (f22 – f32) all while utilizing a high shutter speed (1/250th or more).

Bigger Isn't Always Better

I happen to really like the tank buster cichlids. And most of my photos are of my extensive collection of Central and South American cichlids. As you can imagine, big fish require big tanks. And while my preferred setup still allows me to get enough light, it can still sometimes be a challenge adjusting the output of the individual flash units.

On occasion I will "take my act on the road" and take photos at a local fish show. A few weeks back I had the opportunity to speak at the North Jersey Aquarium Society in Lyndhurst New Jersey. Their local show had an impressive display of entrants...including quite of few of the Betta species.

All of the Betta were arranged in small containers, each about 25cm high and 12 cm wide and square. Each Betta was shielded from the next fish with a small white card. I tried my standard setup, with a single diffused light placed on top of the container…and got some very nice results using a powerful flash on a very small container. The beautiful part of this was all that I had to do was temporarily remove the card to get the fish to react. Once they were face to face with their neighbor, they reacted on cue displaying their fins and posturing for the other fish. It was a perfect photo opportunity.

A good photo is always more than a proper exposure. If you can get the fish to pose, it can make a big difference. With large cichlids it's a matter of a bit of luck combined with timing and dash of knowing how the fish will respond to the camera. With Betta fish it was much simpler.

A Controlled Environment

My good friend Rose Orso, owner of and one of the country's largest importers of fish, pulled me aside and asked if I wouldn't mind taking home a very unique Betta fish to photograph. In the bag the fish looked like it was a very light shade of pink with a grey body. I had never seen one like that and gladly accepted, taking two additional fish as well.

In the past I have prepared fish tanks with the sole purpose of creating a photo tank. You can see a video on how this was done on the Aquamojo You Tube page at: http://www.youtube.com/user/Aquamojo. I decided to do the

same for this shoot, only on a much smaller scale. I purchased a small plastic container about the same size as the one at the show and painted the back in black.

I suspended a piece of egg crate across two cinder blocks and placed the container in the middle. Then with a diffused light above, one below and one to the side, I took my shots. One thing was missing, and that was the predictable interaction that made the fish react and pose. Problem solved, I cut a hole in the egg crate and placed a small hand mirror alongside. The fish's reflection was enough to get them excited.

The Fish Models

I will admit to having a limited knowledge on the Betta fish. I've been intrigued with many of the Labarynth type fish, keeping Snakeheads (*Channa micropeltes*) and forms of Gourami including five of the Giant family (*Osphronemus goramy*) at the same time. The smaller labarynth fish like the Betta are a pleasant change and are much easier to photograph.

One of the things that is strikingly obvious is the the color. All three fish were more vibrant no doubt due to the extreme amount of light shone on such a small area. The other observation was quite simply, what a beautiful fish over all. The natural grace and beauty as they unfurl those big beautiful fins make them a photogrpahers dream.

Overall the "experiment" with photographing this type of fish was a big success and I am looking forward to doing more. In the meantime, I hope you enjoy the photos.

If you have any specific questions about the setup or just aquatic photography in general, drop me an e-mail and I would be delighted to address them either directly or through a similar article.

Mo Devlin is the owner of Aquamojo.Com. He maintains three thousand gallons of fresh water tanks. Over his thirty years in the hobby he has successfully bred many of the Central and South American cichlid fishes. His passion for New World cichlids is only rivaled by his love of photography. Over the years, he has posted images of his collection frequently in his "Today in the Fishroom" series on line across many national and international fish forums. Mo has spent two terms on the board of trustees for the American Cichlid Assn, was chairman of the organization in 2010, and has been the Publicity chairman for the past decade.

photo by Khantipol

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Klunzinger's
Magnificient Wrasse

It's hot and dry in the desert port that is Al-Qusair on the shores of the Red Sea in Egypt. Date palms line the small alleyways of the town, through which a German-born physician named Klunzinger walks his rounds. Bizarrely, almost 140 years later few will remember the Doctor who treated the residents of Al-Qusair, instead he's remembered for his work on the animals of the Red Sea. Imortalised by taxonomy, his name is carryed by numerous fish and insects of the region, named in honour of his work.

Surely amongst the praying mantises and ponyfish to bear his name, it's rather striking that the fish most often associated with Carl Benjamin Klunzinger, isn't named after him at all - but rather, was named by him - and thus bears the common name 'Klunzinger's Wrasse'. In 1871, Klunzinger described *Thalassoma rueppellii*, naming the fish for Eduard Rüppell, a German explorer and naturalist whose work preceeded Klunzingers taxonomy of fishes and marine animals of the region.

Klunzinger's wrasse is sparingly available in the fishkeeping hobby, having a distribution that's limited primarily to the Red Sea. The

THE PORT CITY OF AL-QUSAIR

fish has a striking colouration that is common to juveniles and adults, though some males bear darker edges to their fins. Like all *Thalassoma* wrasses, Klunzinger's Wrasse is a torpedo shaped fish, who use their sleek shape to swim rapidly when required.

A large group of Klunzinger's Wrasses swim over a coral outcropping.

In the wild, the species occurs at shallow depths down to 30 metres (100'). In these habitats, the species is found on reef edges, and drop offs into the open sea. Typically, individuals are found in small groups, these groups are mainly females and one dominant male. Sometimes smaller individuals, juveniles join these groups. Being a social fish that can individually reach 20 cm (8") in length, housing such a group requires a very large aquarium. Volumes from 300-500 litres upward should be considered a minimum to house this species sucessfully in the long-term, though experts may manage in smaller volumes.

As per other *Thalassoma*, Klunzinger's wrasse can be boisterous, particularly when housed in aquariums that are too small. Conspecifics such as tangs are ideal, as they are also large and fast moving. Slow-moving or small-sized species should be added only on the provision of good advice from your aquarium or expert aquarists. The species should be added early to the aquarium and h provided with numerous solid, stable sheltering places in which it can sleep. When startled the species can sometimes bury itself in the sand, so be sure to seat heavy items on the aquarium base where they cannot be undermined. Feeding is straightforward and the species is an unfussy feeder.

Breeding is not currently being undertaken on this species, and all individuals available in the aquarium trade are sourced from the Red Sea. Despite this the IUCN ranks Klunzinger's Wrasse, thankfully, as Least Concern, most notably due to the protection of parts of the Red Sea from collection. As with all marine species, breeding in captivity for the aquarium industry should be a medium-term goal. Hobbyists interested in breeding tropical marine species are directed to www.marinebreeder.org for more information.

Like many large wrasses, Klunzinger's Wrasse ships poorly, so care should be taken to ensure you get healthy stock that has not been mishandled. Insist upon good and ethical handling at your local aquarium, as such precautions are good for the aquarist and good for the fish being shipped.

If you've got the space to house a Klunzinger's Wrasse, you wont be disappointed - they are majestic animals of great appeal - however, be sure you can meet their needs before you purchase!

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Community Noticeboard

New South Wales

Koi Society of Australia
> Coffs Harbour
Meets 14:00, last Sun. each month. 7-9 Prince St. Bellingen.
> Newcastle
Meets 19:00, 1st Tue. each month. P: 4959 6000
> Central coast
Meets 11:00, 1st Sun. each month. Watanobbi Community Centre, Watanobbi.
> Northern Sydney
Meets 20:00, 2nd Wed. each month. West Pymble Memoric Hall, West Pymble.
> Cumberland
http://ksacumberland.webs.com
Meets 19:30, 3rd Wed. each month. Brennan Park Hall, Smithfield.
> Macarthur
Meets 19:30, 4th Mon. each month. Currans Hill Community Hall, Currans Hill.
> Illawarra
Meets 19:00, 4th Tue. each month. Flinders Community Hall, Flinders.
> Southern NSW
P: 02 4454 0194

Marine Aquarium Society of Sydney
http://www.masa.asn.au/mass/
e: mass@masa.asn.au

New South Wales Cichlid Society (NSWCS)
http://www.nswcs.org.au/
Meets 19:30, 1st Sat. each month, Nuwarra Public School, Moorebank.

New South Wales Cichlid Society (NSWCS) - Illawarra.
Meets 19:30, 2nd Sun. each month, Kanahooka High School, Kanahooka.

Australian Koi Association
http://www.akakoi.com

South Australia

South Australian Aquarium Society Inc.
http://aquariums.2om.com/

South Australian Native Fish Association
www.sanfa.org.au
sanfa@bold.net.au

Western Australia

Marine Aquarium Society of WA
www.masa.asn.au/maswa/
maswa@masa.asn.au
phone:
Chris Sutton
0419 858 108

Perth Cichlid Society
www.perthcichlid.com.au

Koi Society of WA
www.koiclubwa.com
Meets 19:30, 4th Wed. each month, Rotary Hall, South Perth.

ACT

Canberra and Districts Aquarium Society (CDAS)
http://drupal.cdas.org.au/
Meets 19:30, 3rd Tue. each month. Harmonie German Club, Narrabundah.

Canberra Killifish Study Group (CKSG)
http://drupal.cdas.org.au/content/killi-corner

Victoria

Advanced Aquarist
http://www.advancedaquarist.com/

ACE - Australian Cichlid Enthusiasts
http://www.aceforums.com.au

Australia New Guinea Fishes Association (ANGFA)
http://www.angfa.org.au

Aquarium Society of Victoria
http://asofv.com.au/

Marine Aquarium Society of Victoria (MASOV)
http://ozreef.org/masov.html
e: dbw@ozreef.org

Victorian Cichlid Society (VCS)
http://home.vicnet.net.au/~cichlid/
Meets 19:30, 1st Wed., The Oakleigh Centre, Oakleigh.

Eastern Districts Aquarium Society
http://www.edas.com.au/
Meets 4th Fri. each month, Willis Rm, Council Offices Nunawading.

EDAS plant study group
http://www.edaspsg.org/

Queensland

Marine Aquarium Society of Regional Queensland
http://www.masrq.org
e: info@masrq.org

Marine Aquarium Society of Queensland
http://www.masa.asn.au/masq.php
e: info@masq.ws
P: 07 3261 8582

ANGFA Qld
http://www.angfaqld.org.au

Gold Coast Aquarium Society (GCAS)
http://www.gcas.net.au

Aquarium and Terrarium Society of Queensland
http://www.aandtsociety.org.au
E: aandtsociety@gmail.com

Marine/Reef Aquarium Society
http://www.aandtsociety.org.au
E: aandtsociety@gmail.com

Queensland Cichlid Group
http://www.qcichlid.org
Meets 20:00, 1st Fri. each month. Bar Jai Hall, Clayfield.

Brisbane Aquatic Plant Study Group
http://bpsg.frell.org/

Tasmania

Tasmanian Aquarium Society

Hobart Cichlid Society
www.tassiecichlids.com

New Zealand

Federation of New Zealand Aquatic Societies
http://www.fnzas.org.nz/

Internet

Wide Bay Aquarium Society
wbaqs.com.au/forum/index.php

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More than just groupers
Family Serranidae

By Aaron Sewell

The family Serranidae is made up of 5 subfamilies that on the surface appear to be vastly different. From the small shoaling anthias to some of the largest bony fish found on coral reefs such as the giant Queensland grouper, huge contrasts appear within this group of fish. This article will discuss the various members of the family, focusing on those that are suited to home aquaria.

Despite the obviously large difference between certain members of the family, to be defined within the same family, there are clearly some characteristics that are shared amongst the different subfamilies. Serranids are carnivores, whether their prey be small planktonic crustaceans or relatively large fish.

Taxonomically, Serranids are defined physically by the presence of 3 spines on the operculum, a main spine that appears as a V shape at the back of the operculum with a smaller spine both above and below the main spine. Also, the presence of 3 spines on the anal fin as well as a complete and continuous lateral line that does not reach the anal fin.

It is not uncommon for Serranids to have vibrant colours, especially reds, purples and oranges. The reason for this is that in shallow water, the colours are bright and allows fish to display during breeding season, at the same time, due to the poor penetration of red light through water, at depth these colours appear dark and dull allowing these brightly coloured fish to hide with relative ease. This is especially prominent in the Epinephelin genera *Cephalopholis*, *Variola* and *Plectropomus*.

Anthiinae

The name Anthias was originally used to describe a species of fish discovered in the Atlantic ocean (*Anthias anthias*) and is a latin word that means sea fish. Ironically, members of the genus *Anthias* are almost non-existant in the aquarium trade (though they are only found in the Atlantic Ocean and cannot be legally imported into Australia anyway).

Anthias are the most commonly kept members of the Serranid family, largely due to the fact that most remain small enough that they are comfortably kept in an average home aquarium. Ironically, they are probably the most difficult members of the family

The Lyretail Anthias (*Pseudanthias squamipinnis*) occur in large schools in the wild around outcrops on the reef. Here they feed actively from the water column, a behaviour that makes them challenging to maintain long-term in the reef aquarium.

for aquarists to care for long term. Being planktonic grazers, anthias fare best with almost continuous feeding and it is often recommended that these fish be fed no less than 4-5 times through the day. Ideal foods include brine and mysis shrimp though most anthias will readily accept flake or pellet foods.

The vast majority of anthias offered to the aquarium trade belong to the genus *Pseudanthias* though there are others, such as the sunburst anthias (*Serranochirrhites latus*) that are commonly available.

Pseudanthias are shoaling fish, often found on the reef by the hundreds, forming harems of a few males with many dozens of females. On the other hand, sunburst anthias are pairing fish that are generally found in deeper water (14-70m) commonly found beneath overhangs (often swimming upside down) or on sheer drop-offs. For this reason, it is usually recommended that *Pseudanthias* be kept in small groups of at least four fish.

the beautiful *Pseudanthias pleurotaenia* (Square-spot fairy basslet). Photo by Jenny Huang.

Most *Pseudanthias* are sexually dichromic protogynous hermaphrodites, or more simply, they start their lives as females and then mature as males and the sexes can be distinguished by colour differences. Females will only become males when an opportunity arises through social dynamics, i.e. if a male dies, the most dominant female will take his place. For the species that form harems this is the reason it is ideal to keep multiple females with just a single male.

Epinephelinae

The epinephelin subfamily is the most recognisable group in the serranid family and are commonly known as groupers (though some go by the name cod or trout). With members such as the coral trout, coral cod, potato cod and the aforementioned giant Queensland grouper, they are very familiar to anyone with an interest in reef fishes. Despite their often immense size, epinephelins make excellent additions to aquariums that are suitably sized due to their hardiness and their willingness to accept just about any foods offered.

While it is common practice to feed large marine predators, such as groupers, scorpionfishes and moray eels live foods, it is something that most people would advise against for a number of reasons. Many feeder fish offered by aquarium stores belong to the family Cyprinidae (goldfish, carp and minnows), generally cheap fish that breed prolifically. The problem with these fish is that they contain a high amount of fat but more importantly they produce an enzyme called thiaminase which leads to a vitamin B1 deficiency and has been shown to be a major health concern for predators. Secondly, the practice of feeding live fish to captive fish is cruel as contrary to what occurs in the wild, captive feeder fish are not given ample opportunity to evade their predator. Groupers should be fed meaty foods and will eagerly accept prawns, whitebait and other suitably sized offerings.

The first concern when contemplating buying an epinephelin grouper is the size of the aquarium it will be housed in as well as the maximum size of the fish. There are several species that are commonly offered to aquarists which reach sizes that make them highly undesirable for the average aquarist (or even those with exceptionally large home aquariums). These include the barramundi cod (*Chromileptes altivelis* – formally changed from the genus name *Cromileptes*), also known as the butterfly cod or polka dot grouper, which can reach 70cm in length. The more ideal members of the family for home aquariums belong to the genus *Cephalopholis* which commonly reach lengths of between 20-50cm. This genus includes the flagtail (*C. urodeta*) and coral rock cods (*C. miniatas*/*Plectropomus* spp.) which reach lengths of 30 and 40cm respectively and make exceptional additions to a suitably sized aquarium with the added bonus of being fairly readily available. Like most groupers, these 2 species are particularly hardy and quite placid with the obvious exception of feeding time where they are usually quite aggressive feeders.

the Barramundi Cod (*Chromileptes altivelis*) is too large for most aquarists and is best admired at a public aquarium or in the wild!

various *Plectropomus* and *Cephalopholis* species make their way into the hobby, though some are too large for most aquarists. Photo by Leonard Low.

Like most members of the serranid family, epinephelin groupers are largely solitary fish that tend to live in and around caves and overhangs where they can hide and ambush their prey. In the aquarium, caves or rock ledges should be provided and only 1 specimen of a given species should be kept in an aquarium. In larger aquariums these fish can be mixed but

The strikingly marked Sixline Soapfish (*Grammistes sexlineatus*) is sometimes seen in the aquarium trade.

In mature Sixline Soapfish the lines break into a series of attractive dashes.

separate rock structures should be provided and they should be sufficiently spaced apart in order to avoid fights for dominance and territory.

Grammistinae

Soapfishes are not common in the aquarium trade but occasionally specimens of a few species such as the sixline soapfish, *Grammistes sexlineatus*, are available. One of the major drawbacks to keeping these fish is the fact they produce a toxic mucous – grammistin - which is released through their skin that has the potential to kill all fish in an average sized aquarium, including the soapfish.

Apart from this, soapfish are extremely hardy and do well in the home aquarium. Like most serranids, they are ambush predators and feed on small fish and crustaceans. This means that they should not be kept with tankmates that are smaller than themselves (or fish that they will grow substantially larger than) and more than one soapfish should not be kept in the same aquarium as they are highly territorial. Despite being territorial against their own kind, soapfish are placid towards other fish and will generally tolerate other fish of equal or greater size.

Hamlet fish are sometimes available and are the best known members of the subfamily Serraninae. Top: Shy Hamlet (*Hypoplectrus guttavarius*), Centre: Barred Hamlet (*Hypoplectrus puella*), Bottom: Indigo Hamlet (*Hypoplectrus indigo*).

Liopropoma rubre aka Peppermint bass.
Photo by Brian Gratwicke

Liopropomatinae

This is a subfamily consisting of just a single genus and 28 species that share a distinct torpedo-like body shape. As a group, the members of the subfamily Liopropomatinae do not have a common name though most members are referred to as bass (such as the peppermint bass, *Liopropoma rubre*) or basslets (such as the pinstriped reef basslet, *Liopropoma susumi*). Members of this subfamily are generally small, reaching up to around 10cm, with some larger species reaching around 15cm. However, despite their size and generally attractive colourations these fish are seldom offered to aquarists. Like other members of the serranid family, these fish are carnivorous and their diet consists primarily of small fish and crustaceans.

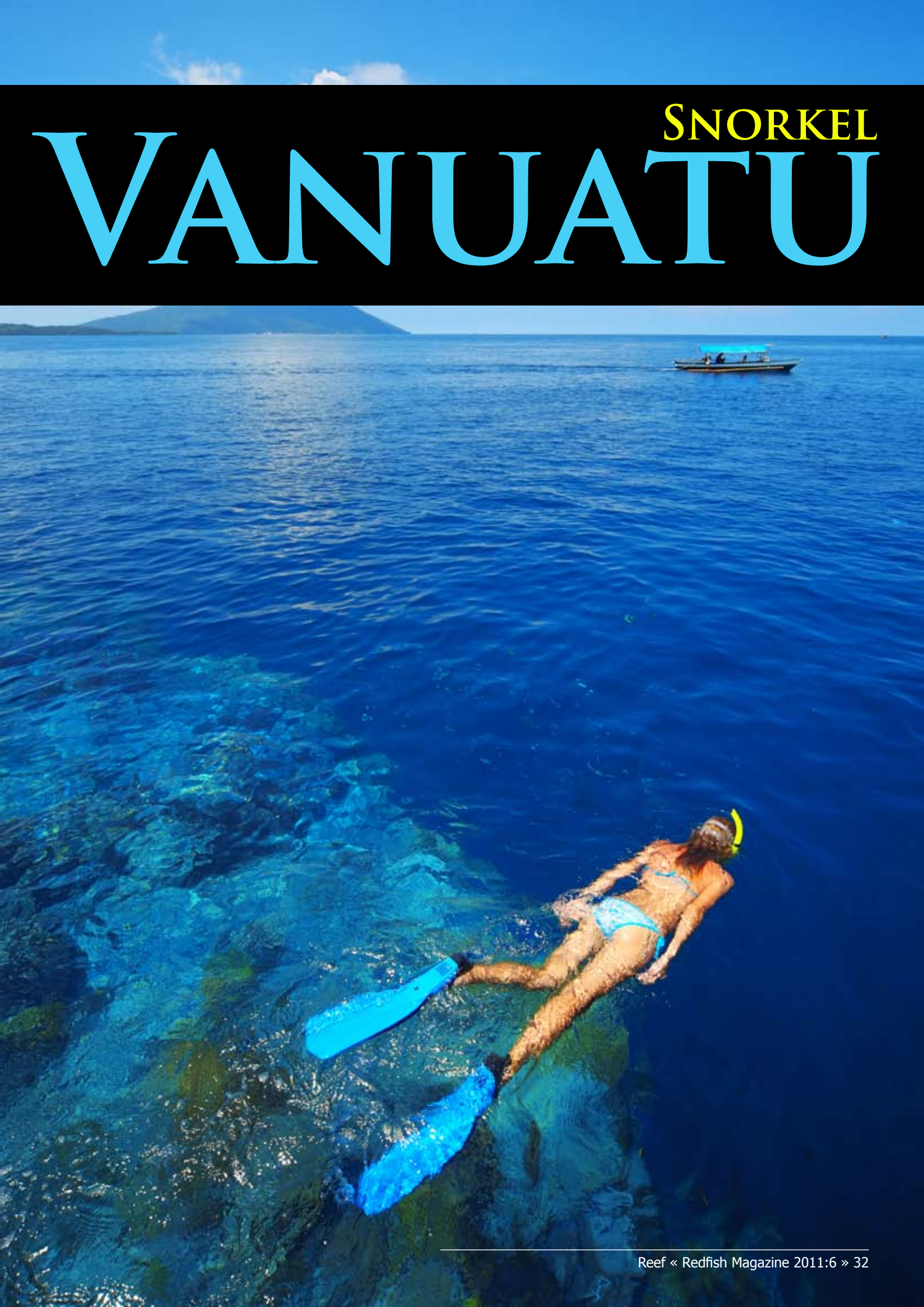
Most information with respect to these fish in aquariums comes from candy basslets (*Liopropoma carmabi*) which are not uncommon in the US aquarium trade though absent from the Australian trade due to import regulations. These fish tend to be quite placid and will cohabitate well with most other aquarium fish of suitable size (keeping in mind they will feed on smaller fish). They are safe to keep with sessile invertebrates such as corals, anemones and molluscs and besides small fish, only pose a threat to crustaceans such as crabs and shrimp. These fish are reclusive and spend most of their time amongst rockwork. Given their behaviour and their small size, it is generally recommended they are kept in fairly small aquariums where they can be viewed easily as they tend to remain out of view in larger aquariums.

Serraninae

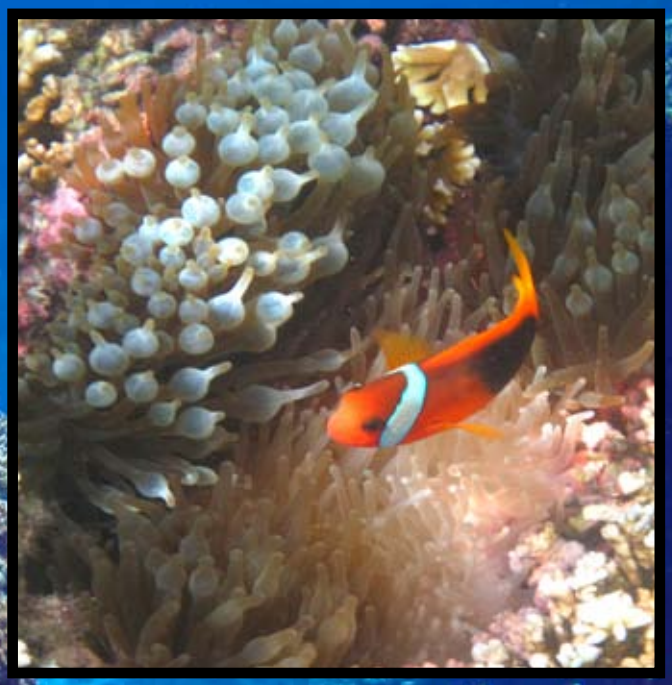
The subfamily serraninae contains few if any species of interest to aquarists. This is not because of aggression, hardiness or size but rather because most members of this subfamily are found in subtropical and temperate waters around the world from southern Australia to the Mediterranean and northern Atlantic Ocean. These fish tend to grow to around 20-40cm so are suitable for larger temperate aquariums and like most members of the family, they are not difficult to keep. Their colours tend to be less vibrant than other Serranids but they still often have bold reds and yellows making them far from unattractive.

In general, serranids are great additions to home aquariums, whether you're after a small shoal of something pretty or something large and colourful with a heap of personality. They are ideal additions to fish only aquariums or full reef aquariums as no members of the family pose a risk to sessile invertebrates such as corals and anemones. They are hugely popular fish for all types of aquarists and there are plenty of reasons behind their popularity.

Snorkel Vanuatu



In September 2011 two members of the Redfish team visited the tropical South Pacific island of Efate, in Vanuatu. We spent almost all of our time there snorkelling the marine sanctuary of Hideaway Island (a small coral atoll just off the main island) and the pristine reefs of Moso Island. It was a unique and rewarding experience to swim with so many of our favourite aquarium species of coral and fish in their natural habitat. Here's a pictorial tour of our time there.

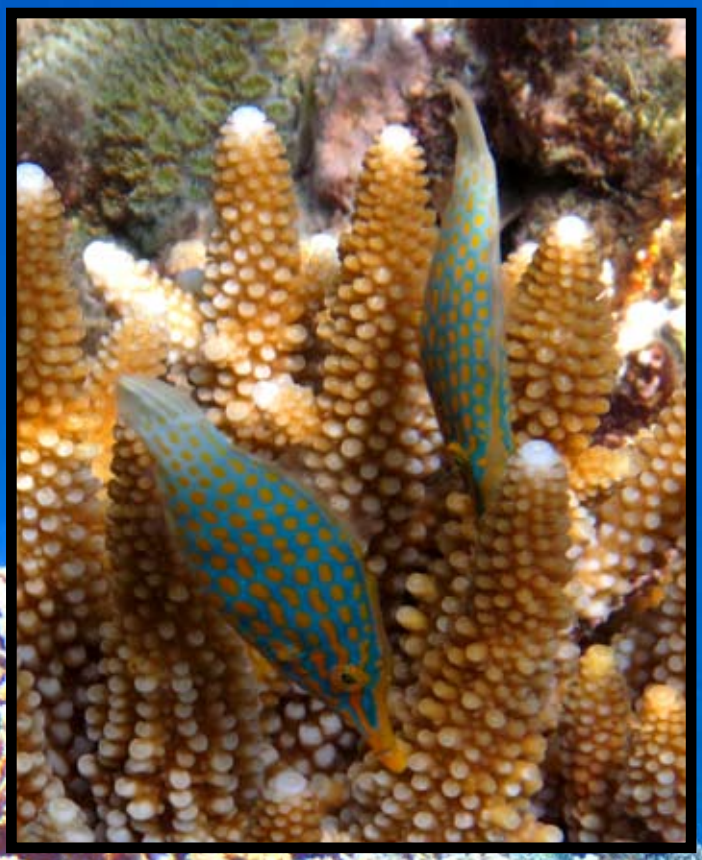


Top left: Interesting invertebrates abound on the reef.
Top right: *Amphiprion melanopus* - one of several anemonefish species found on the reef, hiding in anemone tentacles.
Bottom left: A Spiny Squirrelfish (*Sargocentron spiniferum*)
Bottom right: Colourful wrasses such as this one are very tame and will follow you around the reef like a dog.

Top Left: A brightly coloured coral growing on the Hideaway reef.
Top right: The Scribbled Leatherjacket (*Aluterus scriptus*) can grow to a length of 1 metre.
Right: Clark's anemonefish (*Amphiprion clarkii*)

Top left: One of the many species of friendly, brightly coloured wrasses, this 6-Bar Wrasse, (*Thalassoma hardwicke*), obligingly allowed itself to be photographed!
Top right: These *Amphiprion melanopus* were part of a colony of at least 40 fish, each claiming their own host anemone within quite a small area.
Middle left: Lovely vistas such as this are a common sight when snorkelling the reef at Hideaway Island
Middle right: The fish are extremely tame and take very little notice of human visitors.
Bottom left: This large school of bait fish regularly schooled in the same area and were easy to locate.
Bottom right: One metre long Giant Trevally (*Caranx ignobilis*) constantly patrolled the school of bait fish and would periodically lunge at the group, attempting to catch one of the fish.

Top left: Ring-eyed Hawkfish (*Paracirrhites arcatus*) are common but are shy and can be hard to spot. They are usually found sitting on coral branches.
Top right: *Amphiprion akindynos* is known as the Barrier Reef Anemonefish but it is also found in Vanuatu.
Middle left: Moorish Idols (*Zanclus cornutus*) are a common sight.
Middle right: Giant Clams are plentiful and have a huge range of colours and patterns on their mantles.
Bottom right: This reef near Moso Island is less frequently visited by tourists and as a result is in better condition with a greater variety and denser growth of coral.
Bottom left: *Rhinecanthus verrucosus*, the Blackbelly Triggerfish

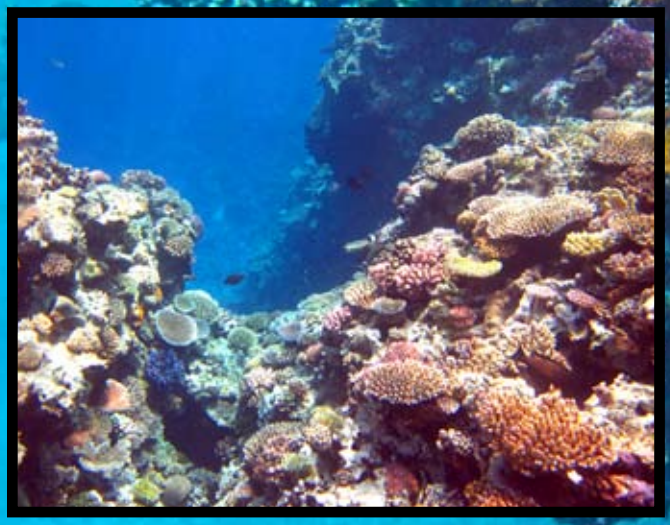


Top left: A pair of Beaked Leatherjackets (*Oxymonacanthus longirostris*), stunning oddities of the reef
Top right: *Amphiprion melanopus*
Bottom left: Locals examine the body of an adult turtle, which has been attacked by a very large shark. Note how cleanly cut the edges of shell are - the shark's bite is so powerful it has sheared through the tough shell without any crushing action. The shark was witnessed by several divers who identified it as a Tiger Shark. The body of the turtle was removed from the water to discourage the shark from staying in the area.
Bottom right: Large, healthy Acropora corals are a welcome sight. These ones are close to a metre in diameter.

Top left: The wonderfully patterned Undulated Triggerfish (*Balistapus undulatus*) is easily found on the reef.
Top right: Parrotfish constantly chew on the hard corals.
Middle left: The Clown Wrasse (*Coris gaimard*) is not only a very pretty fish, it also has a lot of personality!
Middle right: The Chevroned Butterflyfish (*Chaetodon trifasciatus*).
Bottom left: The Dragon Wrasse (*Novaculichthys taeniourus*) is a robust fish which is able to move quite large chunks of coral rubble and rocks with its mouth when looking for food.
Bottom right: *Balistapus undulatus*

Top right: A perfect tropical view from the Tranquility Island turtle sanctuary, in northern Efate.
Top left: facilites at Hideaway Island.
Middle left: The Hideaway Island jetty.
Middle right: Mele Cascades are only a short distance from Port Vila.
Bottom left: Mele Cascades - not all of Vanuatu's beauty is underwater!
Bottom right: Hideaway Island as viewed from the surrounding reef.

Top left: This Barracuda cruised slowly past, allowing us to estimate its length at about 1.6 metres.
Top right: This Giant Moray Eel (with Cleaner Wrasse) is a resident of the Hideaway reef. It lives up to its name, measuring at least 3 metres in length.
Bottom left: One of the pristine reefs of Moso Island.
Bottom right: Another reef just off Moso Island.



Scuba diving on a tropical coral reef is an amazing experience, but it requires a lot of equipment and training, and for health reasons is not always possible for everyone. Snorkelling is a great low-tech alternative to diving - the equipment is much simpler and only basic swimming and ocean safety knowledge is required. The reefs of Vanuatu are easily accessible for snorkellers and offer a rich and diverse array of fish and corals to explore. We'd highly recommend Vanuatu as a destination for anyone with an interest in fish.

ILLUMINATION

by Sara Allyn Mavinkurve

PART II

Now that you know all about light itself, this article (Part II of two), will discuss the different types of lighting systems and fixtures available for aquariums. Almost all aquarium lighting falls into one of three broad categories; metal halide, fluorescent, and LED.

Fluorescent

Fluorescent lighting utilizes a bulb enclosing mercury vapor. Electricity passing through the mercury vapor results in the production of ultraviolet light. This ultraviolet light causes phosphor to "fluoresce" (i.e. produce visible light).

Linear tube fluorescent bulbs come in a variety of different diameters (sizes around). Some of the different styles, shapes and sizes of fluorescent bulbs are referred to as T2, T8, T12, T5, etc. If you thought the "T" in T5 stood for something highly technical, I'm sorry to disappoint you. The "T" in T5 simply stands for "Tube." In any event, linear tube fluorescent bulbs are used in a great number of aquarium lighting fixtures. Generally, T5 lighting is relatively efficient, affordable and reliable.

T5 bulbs are a favorite for aquarium light fixtures for a few reasons. One reason is that they have a small diameter (about a centimeter and a half). The smaller the diameter, the more bulbs you can line up over the width of an aquarium. T5 fluorescent bulbs are also generally more efficient, producing in the range of 70 to 100 lumens per watt. "Compact" fluorescent bulbs are just fluorescent bulbs which have been bent and/or twisted around, in one fashion or another, presumably to allow them fit in a smaller space. A compact fluorescent bulb could be one continuous tube simply bent in half once, or it could be twisted around to fit into a space normally intended for a round incandescent bulb. High Output (HO) fluorescent bulbs and fixtures produce more light but also consume more watts. Very High Output (VHO) fluorescent bulbs produce even more light and consume even more electricity.

There are all kinds of fluorescent lighting fixtures available for aquariums, in just about all sizes and lighting demands. Some may say that you can't keep *Acropora* sp. (or any "SPS") under fluorescent lighting. However, that's simply not true. I'll concede that it might be difficult to keep SPS corals at two or three feet below a T5 lighting fixture (due to lack of light at that depth). However, you can certainly keep SPS corals higher up in an aquarium with sufficient T5 lighting. The drawbacks of fluorescent lighting are 1) need for bulb replacement every six months, and 2) limited light intensity over a given area.

Metal Halide

Also known as "flood lights," metal halide bulbs and fixtures probably offer the most intense lighting readily available to reef aquarists at affordable prices. Metal halide bulbs are either single (mogul base) or double ended (HQI). The double ended bulbs are thought to produce more light. Ballasts for metal halide light fixtures come in different wattages and varieties. Electronic ballasts are thought to be somewhat

more efficient than magnetic ballasts.

Metal halide lights have their pros and cons. Under the pros of metal halides is that these lights are reliable producers of high intensity lighting. They are available in relatively inexpensive forms, and are available in several different K ratings. Under the cons, metal halide lights are rapacious consumers of electricity and notorious heat producers. It's not an exaggeration to say you could "cook an egg" on a typical 250 watt metal halide light pendant after it's been on for an hour or two. Metal halide bulbs, like fluorescent bulbs, contain mercury vapor. One major difference is that metal halide bulbs also contain "metal salts" which increase light intensity. Different kinds of metal salts, and different mixes of gases/vapors inside the bulb, can produce different spectrum patterns of light (and different K ratings). Most metal halide light fixtures produce in the range of 60 to 120 lumens per watt. The quality of the bulb certainly makes a difference.

Aesthetically speaking, metal halide lighting is probably the most visually appealing to most people (at least in my experience). Most notably, metal halide lighting produces "glitter lines" (flickering beams of light which look like sunlight through water). Some LED light fixtures also produce some of this glitter line effect. For whatever reason, we don't see much, if any, of this glitter line effect with fluorescent lighting.

LED

Light-emitting diodes represent an entirely different kind of lighting. LED "bulbs" are not tubes filled with mercury vapor. The basic unit of any LED light is deceptively simple. It's a cathode and an anode inside a semiconductor material. I'll try to give an over-simplified explanation of how it all works. An LED light unit creates an environment wherein higher energy electrons can fall into a lower state of energy, emitting light as they do so. The difference between the starting and ending energy states of the electrons (the "band gap" in technical terms) determines the wavelength of the light produced. This is the basic physical process common to all LED lights. Just about everything else about an LED light can vary. Consequently LED lights come in a great variety of shapes, sizes, intensities and colors. There are countless types of semiconducting materials which can be used (and more are developed every day).

Long story short, not all LED lights are the same, much less equal. Although I understand the excitement over LED lights (in many applications, ranging from aquariums to Christmas trees), I've noticed that this new "craze" has resulted in some exaggerated buzzing on the merits of LED lights. Most notably, LED lights are sometimes rumored to be highly efficient, cool-running and last a lifetime. As the expression goes, "if something sounds too good to be true, it probably is." The truth is that not all LED lights deserve such a fantastic reputation. In fact, only a few types are able to produce the high intensity light needed for normal sized reef aquariums.

Not all LED lights are entirely cool-running. In fact, many high power LED lights heat up to the point of threatening their own integrity. A well designed LED light will direct heat away from the light source. To combat the heat, many high power LED lights are also equipped with an aluminum heat sink (which often looks like a silver micron filter shaped structure behind the light source). No big deal, right? Well, one of the things people tend to like about LED lights is that they're usually compact and smaller than other lights. However, these heat sinks can add quite a lot of bulk to these lights. Once all is said and done, a well designed high output LED lighting system, capable of producing enough light for a reef aquarium, could potentially take up just as much space as any other lighting system. Any high intensity LED light is going to produce at least some heat. If the light isn't designed well, the heat will not be adequately directed away from the light source. Such faulty designs can cause the lights to fail. It's true that LED lights, in many applications, are strikingly more efficient than their incandescent and/or halogen bulb counterparts. However, believe it or not, in terms of lumens per watt, many LED lights (in application) are only about as efficient as quality T5 fluorescent lighting. In theory, LED lights could, in the future, be far more efficient than they currently are. Right now, when it comes to efficiency, most LEDs are not much (if at all) better than any high efficiency fluorescent lighting system.
LED lights do not last forever. Well designed, high quality, LED lights can last up to 20+ years of continu-

ous use. That much is true. Unfortunately, there are a lot of low quality, poorly designed, LED lights out there on the market. Lower quality LED lights will almost certainly fail; if not immediately, then within a matter of time.

Don't get me wrong, I'm just as excited about LEDs as anyone. I even spent $60 on one of those nifty new dimmable LED PAR38 bulbs (which came with a remote control!). Unfortunately, I couldn't find any practical use for it. It was a cool "toy" and probably would have made a great light for a nano-reef aquarium. In any event, my personal opinion is that, currently, the available quality LED aquarium fixtures (for "normal" sized aquariums) are prohibitively expensive. The more affordable LED fixtures are typically small and/or otherwise not sufficient for normal sized reef aquariums (unless you acquire several units). DIY LED fixtures might be cheaper, but they're still rather pricy to construct.

Many people believe that the high cost of LED light aquarium fixtures is due, at least in part, to the expensive litigation between Orbitec and PFO (two lighting companies fighting over a patent). Some aquarists are hopeful that once this patent dispute is resolved, one way or another, the price for LED light fixtures will decline. Personally, I'm not so sure that will be the case. Patent disputes often go on for years with no concrete resolution. More often than not, the parties in dispute come to an agreement behind closed doors. Whatever the outcome of the Orbitec patent dispute, I wouldn't expect the price of quality LED aquarium light fixtures to decline any time soon. In fact, I personally think prices might even go up as more expensive and more advanced technologies become available. Who knows?

So now that you know at least a little bit about all the different types of aquarium lighting, here are some tips I've picked up over the years:

Five Tips for Choosing a Lighting System:

1. Consider your budget. This requires consideration of more than just the initial cost of the set up. Estimate the monthly electricity cost. Also factor in the cost of bulb replacements (if applicable).
2. Don't forget the ballast! If you're buying a light fixture, make sure you know whether or not it comes with the required ballast. Some aquarium light fixtures have the ballast(s) built into the fixture itself; others don't.
3. Know what you want to keep. Obviously, the kinds of corals you plan to keep will determine how much light you need.
4. Take your time. Most reef aquarists spend anywhere from a few hundred to a few thousand dollars on their lighting systems. When you're putting out that kind of cash, you want to make sure you're getting what you pay for – and getting what you want. Don't focus on trying to find the cheapest (or the most expensive) lighting system available. Look for quality and value.
5. Look around. Ask around. Pay attention to what lighting fixtures you see over other aquariums (in your LFS, at your friend's house, etc.) If you don't know what it is you're looking at, ask. Ask people about their experiences with different types of systems and different brands. Look at ratings and reviews on vendor websites.

I hope you've enjoyed reading these two articles on aquarium lighting. I've certainly enjoyed writing them. Now, if only I could decide on what lighting system to get for my own aquarium!

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